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LOBLOLLY PINE RELEASE STUDY

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LOBLOLLY PINE RELEASE Report #23

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ABSTRACT

This study included three treatments in which basal spraying, using two different concentrations of 2,4,5-T, was compared to no release. Basal spraying was done in April, following the first growing season in the field. Hardwood competition was moderate. At age 19, after adjusting for differences in initial loblolly pine stocking using covariance analysis, cordwood yields averaged 22 percent more on 1:20 plots, but 17 percent less on 1:40 plots, compared to check plots. At age 19, there was no relationship between cordwood yields and hardwood basal area measured at age 19 ($r^2 = .002$), but there was a weak correlation with a free-to-grow index estimated at age 2 ($r^2 = .314$).

INTRODUCTION

This is the twenty-third in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This study was installed on the privately-owned Ayres tract in Accomack County, on the Eastern Shore of Virginia. The previous stand was mostly hardwood. The site was prepared by prescribed-burning during the summer of 1970, and was planted in February 1971. Basal spraying was done on April 12 and 13, 1972, after only one growing season in the field. Three swaths, each 2 chains wide and 10 chains long, were established (Figure 1).

One swath was basal sprayed using a 1:40 dilution of 2,4,5-T in fuel oil and another swath was basal sprayed using a 1:20 dilution, leaving the third swath unsprayed as a control. The 2,4,5-T contained four pounds of active ingredient per gallon.

GROWTH PLOT INSTALLATION

Plots were installed the following winter, in February, after the seedlings had been through two growing seasons. Nine 1/10-acre plots were installed, three in each swath (Figure 1). Hardwood competition was moderate. Volunteer loblolly pine seedlings were pulled up when the plots were installed.

Measurements were made at age 2, when the plots were established, and at ages 8, 13, and 19. At age 2, all loblolly pine seedlings were measured for height to the nearest foot, and classified as to free-to-grow status, using a four-part classification system.¹ At later measurements, diameter

¹ See Occasional Report No. 78 (Release Report No. 11) for a description and discussion of this classification system.

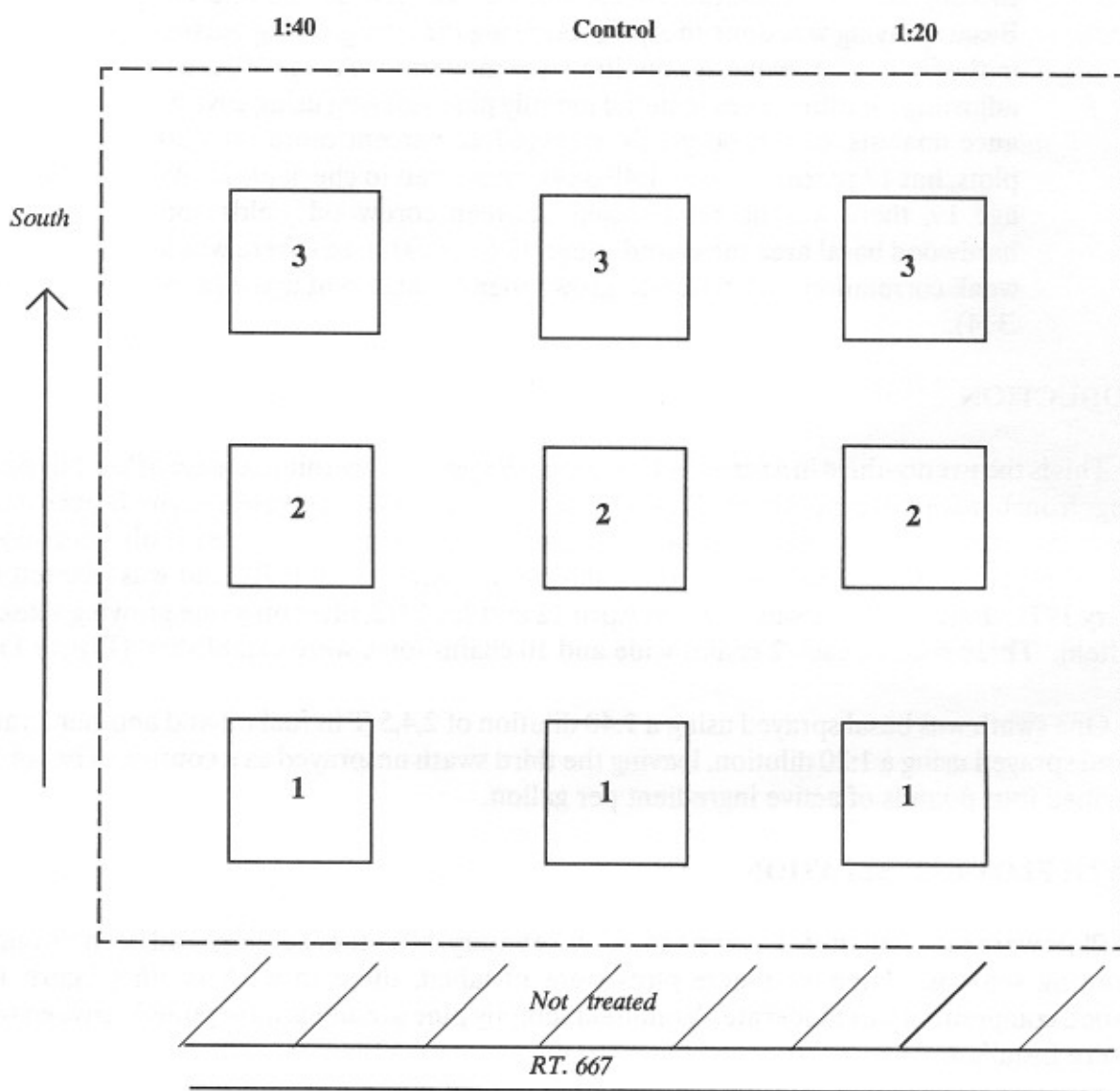


Figure 1. Layout of growth plots.

at breast height of each loblolly pine was measured to the nearest inch and a sample of trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. For the final measurement at age 19, all hardwoods over .5 inch DBH were tallied by species, 1-inch diameter class, and crown class. Total height to the nearest foot was measured on 90 percent of the intermediate and codominant hardwoods (there were no dominant hardwoods at age 19).

RESULTS AND DISCUSSION

A summary of loblolly pine data for the four measurements is presented in Table 1. Differences due to release increased with time (Table 2). Table 3 presents stand tables for loblolly pine at age 19.

Loblolly pine stocking at age 2 ranged from 180 to 420 seedlings per acre on the nine plots. Average stocking was 280, 383, and 293 seedlings per acre at age 2 on the check, 1:40, and 1:20 plots, respectively. Yields were related to initial numbers of seedlings (Figure 2). The regression lines in Figure 2 were fitted separately to the check, 1:40, and 1:20 plots, and have similar slopes (.050, .074, and .064, respectively). When covariance analysis was used to adjust for the different numbers of seedlings present on each plot at age 2, the adjusted yields were 16.2, 13.5, and 19.8 cords for the check, 1:40, and 1:20 plots, respectively (compared to 14.1, 17.0, and 18.4 cords before adjustment). These adjusted yields were significantly different (probability of a larger $F = .0008$).

A summary of hardwood data at the final measurement at age 19 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. The basal spray treatments had little effect on hardwood numbers and basal area at age 19. The 1:20 plots, on the average, had almost as many hardwoods and almost as much hardwood basal area as the check plots, but the 1:40 plots had about 1/4 fewer hardwoods and 1/3 less hardwood basal area than the check plots. There is no reason why the 1:40 treatment should have provided better hardwood control than the 1:20 treatment.

Hardwood competition was moderate when the plots were installed, but most of the hardwoods fell behind fairly quickly and ended up as over-topped. There were no dominant hardwoods and only three codominant hardwoods on all nine plots, and all three of these were on 1:20 plot 1. These three trees were as tall as many of the dominant and codominant loblolly pines on this plot. Even so, we feel that this plot, and all of the other released plots, will eventually end up with pure loblolly pine in the canopy. Check plot 3 had very low initial stocking, 180 loblolly per acre, and, even though none of the hardwoods are any better than intermediate, there are some large holes that may never be "filled in" by loblolly pine crowns. Our estimate is that check plot 3 will end up about 75 percent pine, but the other two check plots should end up with pure loblolly pine.

Cordwood yields of loblolly pine at age 19 were not related to the amount of hardwood present (Figure 3). There was, however, a weak correlation between cordwood yields and the average free-to-grow index for each plot at age 2. Table 7 shows the percent of trees in each free-to-grow class for each plot, at age 2. In Figure 4, pine cordwood yields at age 19 are plotted over

Table 1. A summary of loblolly data at ages 2, 8, 13, and 19: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

Check Plots							1:40 Plots					1:20 Plots						
Age	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
2	1	320	-	-	-	2.8	1	420	-	-	-	2.6	1	310	-	-	-	2.5
	2	340	-	-	-	3.3	2	360	-	-	-	2.7	2	280	-	-	-	3.0
	3	180	-	-	-	2.9	3	370	-	-	-	2.9	3	290	-	-	-	2.8
	Means	280	-	-	-	3.0	Means	383	-	-	-	2.7	Means	293	-	-	-	2.8
8	1	310	3.24	17.6	-	18.0	1	420	2.93	26.9	-	19.2	1	310	3.72	27.0	-	20.2
	2	340	3.56	27.4	-	22.0	2	360	3.05	21.8	-	19.8	2	280	4.04	27.1	-	20.4
	3	180	2.62	8.0	-	19.5	3	370	2.93	21.1	-	16.4	3	290	3.93	24.9	-	21.2
	Means	277	3.14	17.6	-	19.8	Means	383	2.97	23.3	-	18.5	Means	293	3.90	26.3	-	20.6
13	1	310	5.16	47.8	3.4	29.7	1	420	5.21	68.0	5.9	28.9	1	300	5.87	62.0	7.2	32.3
	2	330	5.48	59.3	5.9	30.1	2	350	5.26	57.0	5.5	30.0	2	270	6.04	57.9	6.7	31.3
	3	180	4.53	25.3	2.3	28.0	3	370	5.08	54.9	4.6	28.3	3	290	5.86	55.7	5.8	29.9
	Means	273	5.06	44.1	3.9	29.3	Means	380	5.18	60.0	5.3	29.1	Means	287	5.92	58.5	6.6	31.2
19	1	300	7.10	88.2	15.5	42.0	1	380	7.08	111.0	19.8	42.0	1	290	7.83	104.2	19.5	43.6
	2	320	7.25	98.5	17.7	42.7	2	350	6.74	95.3	15.8	42.1	2	240	8.46	96.5	17.6	41.7
	3	160	7.50	53.2	9.2	41.7	3	360	6.75	95.5	15.3	40.5	3	290	7.69	99.2	18.2	43.1
	Means	260	7.28	80.0	14.1	42.1	Means	363	6.86	100.6	17.0	41.5	Means	273	7.99	100.0	18.4	42.8

*Except at age 2, where heights presented are for all trees.

Table 2. Average differences between check and released plots at each measurement, for basal area and standard cords per acre.

<u>Age</u>	<u>1:40 minus Check</u>		<u>1:20 minus Check</u>	
	<u>Basal Area</u>	<u>Std. Cds.</u>	<u>Basal Area</u>	<u>Std. Cds.</u>
8	5.7	-	8.7	-
13	15.9	1.4	14.4	2.7
19	20.6	2.9	20.0	4.3

Table 3. Average number of loblolly pine per acre by diameter class at age 19.

<u>DBH</u>	<u>Check Plots</u>	<u>1:40 Plots</u>	<u>1:20 Plots</u>
2	0	13	0
3	17	17	0
4	10	17	17
5	20	33	7
6	43	37	37
7	40	86	43
8	57	97	64
9	37	53	53
10	33	7	33
11	3	3	13
12	0	0	3
13	0	0	0
14	0	0	3
Totals	260	363	273

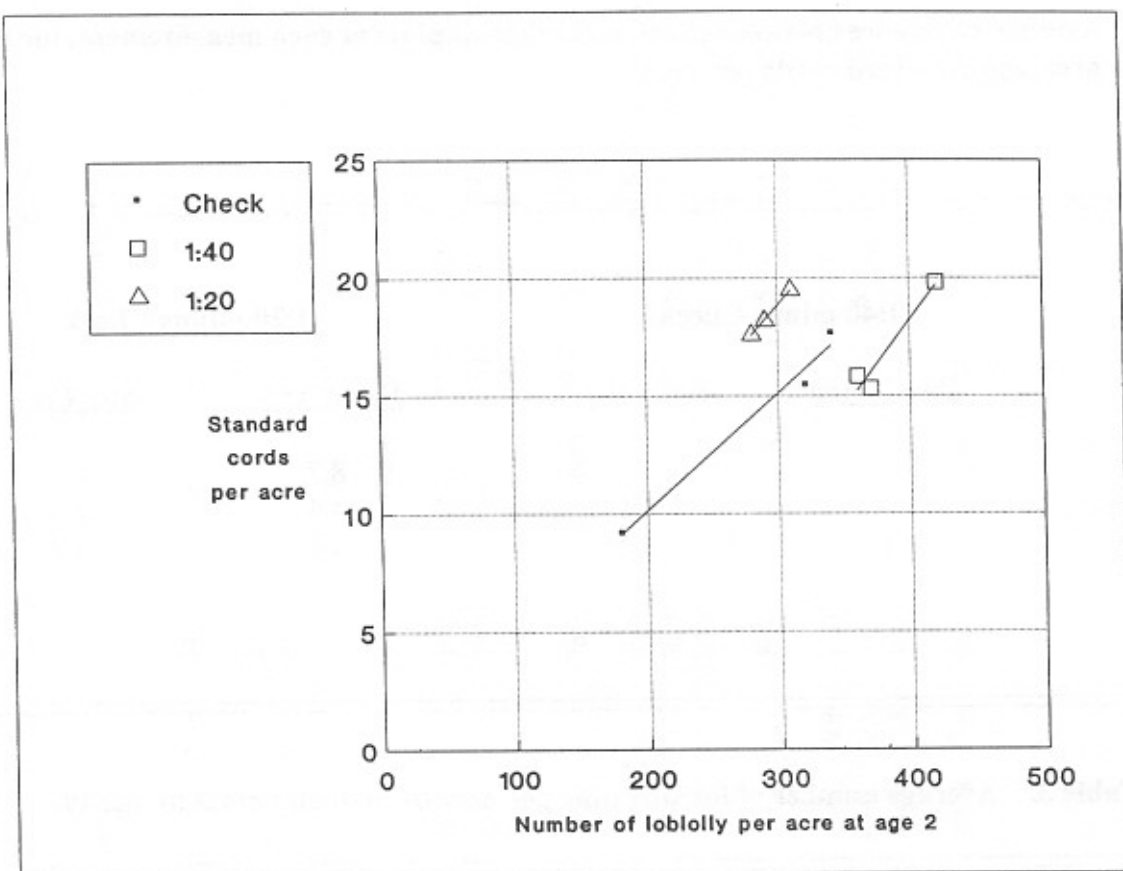


Figure 2. Pine cordwood yields at age 19 related to number of loblolly at age 2.

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 19.

Check Plots DBH						
Species	1	2	3	4	5	Totals
Red oak	200	184	87	43	7	521
White oak	13	17	33	10		73
Water oak	27	33	10	3		73
Sweetgum	197	83	30			310
Red maple	570	90	3			663
Blackgum	347	23				370
Wax myrtle	203	23				226
Holly	50					50
Sassafras	27					27
Black cherry	10					10
Persimmon	13					13
Hickory	3					3
Sweetbay	7					7
Totals	1,667	453	163	56	7	2,346

1:40 Plots DBH						
Species	1	2	3	4	5	Totals
Red oak	540	190	100	7		837
White oak	10	20	10	3	3	46
Sweetgum	197	60	17	4		278
Red maple	153	44	7			204
Blackgum	147	13	3			163
Wax myrtle	107					107
Holly	3					3
Sassafras	33					33
Black cherry	27	3				30
Hickory		3				3
Totals	1,217	333	137	14	3	1,704

1:20 Plots DBH						
Species	1	2	3	4	5	Totals
Red oak	230	161	49	7		447
White oak	47	40	27		3	117
Water oak	100	60	13			173
Sweetgum	183	110	37	20		350
Red maple	180	110	23	3	3	319
Blackgum	287	17				304
Wax myrtle	170	33				203
Holly	7	3				10
Sassafras	150	3				153
Black cherry	13	13	7			33
Persimmon	17					17
Dogwood	17					17
Black locust		3	7	7		17
Bigtooth aspen	3					3
Totals	1,404	553	163	37	6	2,163

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 19.

Check Plots					
<u>DBH</u>	<u>Over-topped</u>	<u>Intermediate</u>	<u>Codominant</u>	<u>Dominant</u>	<u>Totals</u>
1	1,667				1,667
2	453				453
3	123	40			163
4	20	36			56
5		7			7
Totals	2,263	83			2,346
B.A.	26.8	6.1			32.8

1:40 Plots					
<u>DBH</u>	<u>Over-topped</u>	<u>Intermediate</u>	<u>Codominant</u>	<u>Dominant</u>	<u>Totals</u>
1	1,217				1,217
2	333				333
3	127	10			137
4		14			14
5		3			3
Totals	1,677	27			1,704
B.A.	20.1	2.1			22.3

1:20 Plots					
<u>DBH</u>	<u>Over-topped</u>	<u>Intermediate</u>	<u>Codominant</u>	<u>Dominant</u>	<u>Totals</u>
1	1,404				1,404
2	553				553
3	123	40			163
4	13	17	7		37
5		3	3		6
Totals	2,093	60	10		2,163
B.A.	26.9	3.9	1.0		31.8

Table 6. Numbers of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

Check - #1						Check - #2						Check - #3					
DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals
1	136				136	1	203				203	1	161				161
2	48				48	2	55				55	2	33				33
3	11	6			17	3	15	5			20	3	11	1			12
4		2			2	4	3	4			7	4	3	5			8
						5		1			1	5		1			1
Totals	195	8			203	Totals	276	10			286	Totals	208	7			215
B.A.	2.33	.47			2.80	B.A.	3.31	.73			4.04	B.A.	2.40	.62			3.02

1:40 - #1						1:40 - #2						1:40 - #3					
DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals
1	124				124	1	120				120	1	121				121
2	35				35	2	19				19	2	46				46
3	10				10	3	12	1			13	3	16	2			18
						4		3			3	4		1			1
						5		1			1						
Totals	169				169	Totals	151	5			156	Totals	183	3			186
B.A.	1.93				1.93	B.A.	1.66	.45			2.11	B.A.	2.45	.18			2.63

1:20 - #1						1:20 - #2						1:20 - #3					
DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals	DBH	O	I	CD	D	Totals
1	125				125	1	126				126	1	170				170
2	54				54	2	57				57	2	55				55
3	17	2			19	3	12	7			19	3	8	3			11
4	3	5	2		10	4						4	1				1
5			1		1	5		1			1						
Totals	199	7	3		209	Totals	195	8			203	Totals	234	3			237
B.A.	2.96	.54	.31		3.80	B.A.	2.52	.48			3.00	B.A.	2.61	.15			2.75

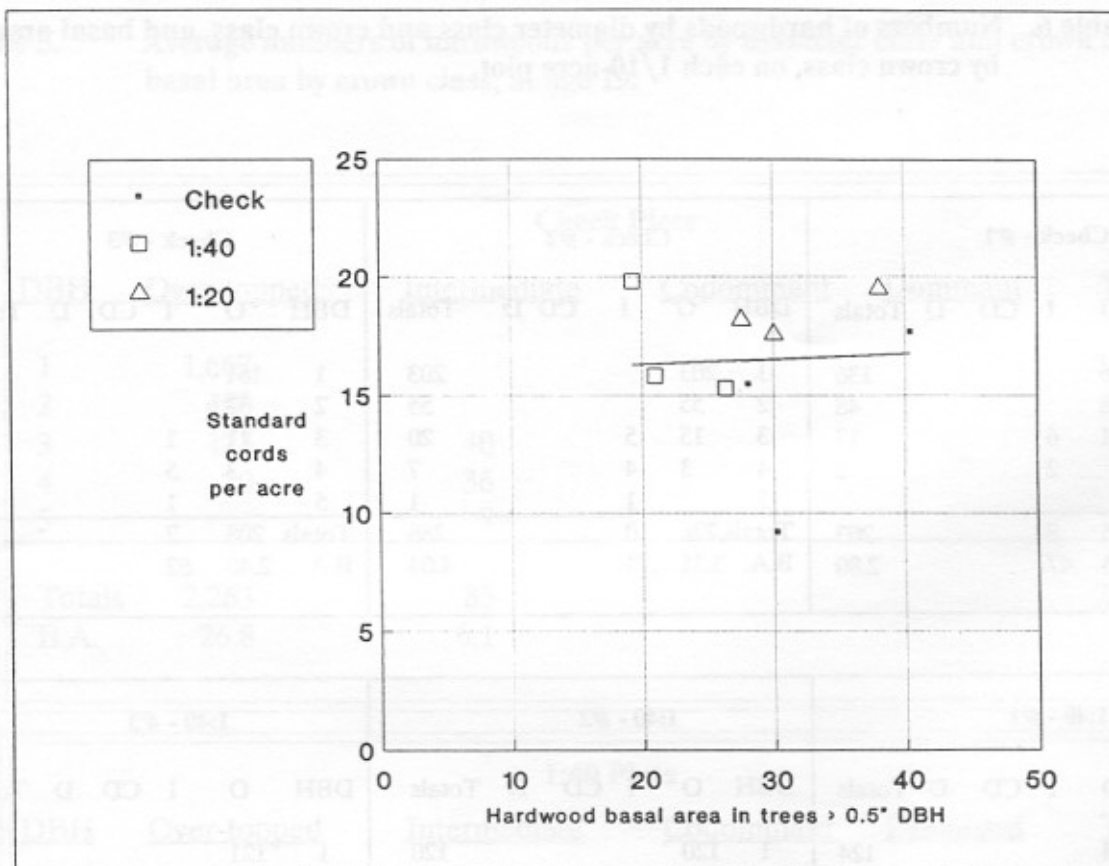


Figure 3. Pine cordwood yields at age 19 related to hardwood basal area.

Table 7. Percent of trees by free-to-grow class for each plot, at age 2.

		FTG Class				Means
	Plot	1	2	3	4	
Check	1	7	63	26	4	2.26
	2	19	66	12	3	2.00
	3	15	62	23		2.08
	Means	14	64	20	2	2.11
1:40	1	65	35			1.35
	2	41	59			1.59
	3	55	39	3	3	1.55
	Means	54	44	1	1	1.50
1:20	1	52	38	10		1.59
	2	65	31	4		1.38
	3	35	61	4		1.69
	Means	51	43	6		1.55

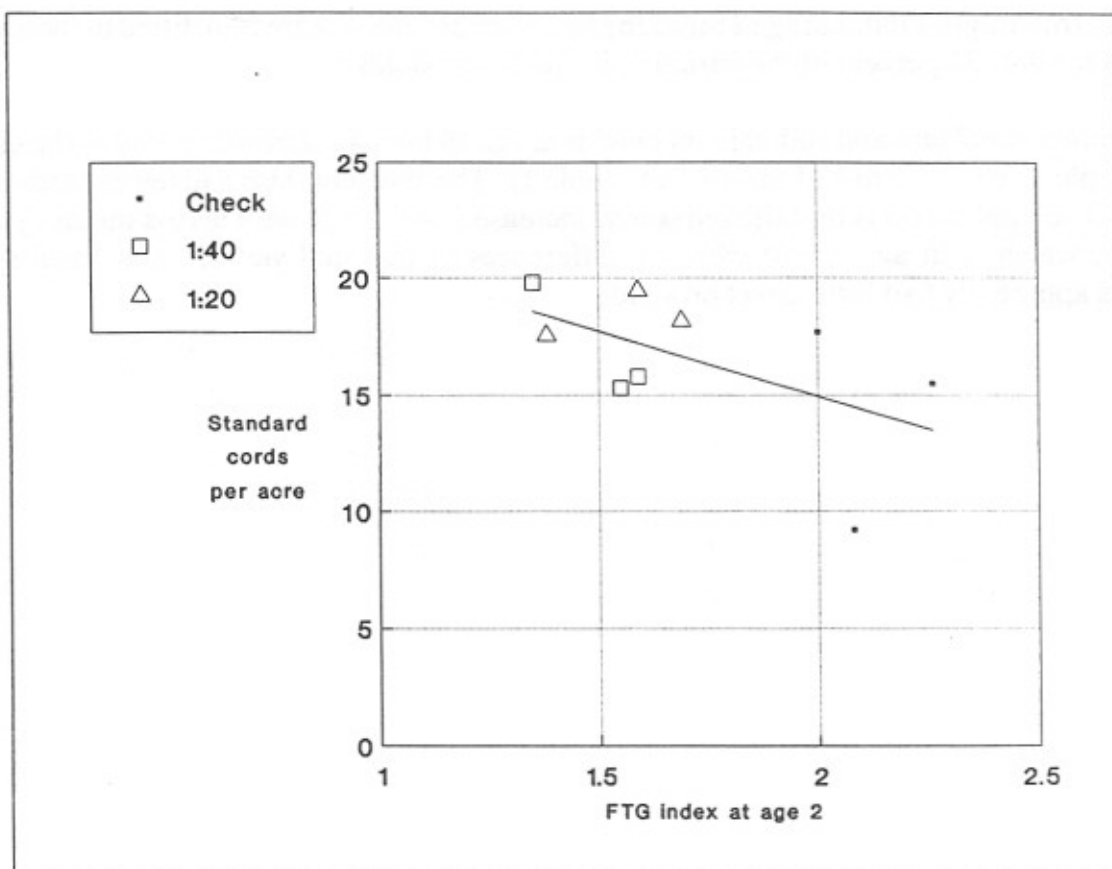


Figure 4. Pine cordwood yields at age 19 related to FTG index.

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